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Range expansion? First record of parti-coloured bat (*Vespertilio murinus* Linnaeus, 1758) in Tuscany, Italy

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Abstract: *Vespertilio murinus* is a paleartic species. In Italy it is a rare species, apparently confined in the northern regions. During a survey on Tuscany bats, the authors have found an individual in the town of Prato. This finding significantly expands the Italian range of this species southward. A greater sampling effort and new records will be essential for determining the status of the parti-coloured male specimens in Italy.

Key words: *Vespertilio murinus*, distribution, Italy

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Parti-coloured bat (*Vespertilio murinus* L., 1758) is reported on a large portion of the Palearctic region. In northern Italy, Switzerland and France, the species reaches the western limit of its range (Mattei-Roesli et al. 2011, Lanza 2012). Its distribution within the area is heterogeneous, with a neat spatial segregation of males and females and a significant number of single migrating or wintering individuals (Dietz et al. 2009, Mattei-Roesli et al. 2011).

The *taxon* is considered to be partially migratory, with a maximum documented displacement of 1787 km from Russia to France (Hutterer et al. 2005). In Italy, the species is only known for the northern regions (Lanza 2012). The finding of a dead specimen has recently been reported in Piedmont (Toffoli & Culasso 2011), while for Lombardy the capture of a specimen in the city of Milan is reported by De Carli and Fornasari (in verbis, cited in Agnelli et al. 2006).

Lanza (2012) does not quote this latest data and deems that the presence of *V. murinus* in Lombardy has still to be confirmed. The species has also been documented for the central and eastern Alps, in the regions of Friuli Venezia Giulia and Trentino Alto Adige (Ruffo & Stoch 2005, Lanza 2012).

In Tuscany, the species was reported at Accesa Lake (Grosseto province) on the basis of surveys with bat detector Pettersson D200 (eterodina) and direct observation while in straight flight (Řehák 2010). Ultrasounds of *V. murinus* show a great similarity with those of some other species present in Tuscany (eg. *Nyctalus leisleri* and *Eptesicus serotinus*), therefore this signal was not regarded as sufficient evidence of the presence of the species in the region, an area relatively far from its known distribution area.

As part of a monitoring program on bats in Tuscany, on 25th September 2014 an individual was found on the wall of a terrace in the north-central part of the town of Prato (F. Moggi street, 43°53'46"N - 11° 5'59"E) (Fig. 1). It is an adult male identified as *V. murinus* on the basis of the diagnostic characters indicated by Dietz & Von Helversen (2004). The specimen was in excellent physical condition, with a visible accumulation of fat between the shoulder blades. The following measures were taken: weight 19.9 g; forearm 44.9 mm; length of fifth finger (D5): 51.1 mm ; length of third finger (D3): 73.2 mm. Dorsal pelage dark brown with white hair tips (Fig. 2); penis long and very narrow (Fig. 3). The individual has been photographed and its ultrasounds recordings were made when hand-released. Recordings were made with a Pettersson Elektronik D-240X ultrasound detector, connected to an Edirol R-09. The resulting sequence was then analyzed (BatSound 3.10) using a sampling frequency of 44.1 kHz and a 512 pt FFT. The spectrogram

Fig. 1 - Record of *Vespertilio murinus* in Tuscany. 1= Prato; 2=Accesa Lake. Shaded area shows the distribution area of *V. murinus* according to Dietz *et al.* (2009) .

analysis shows the following values: Start Frequency (SF): 50 KHz; End frequency (EF): 22 KHz ; Frequency of peak Energy (Fmax) = 25.2 KHz (Obrist et al. 2004).

The discovery of this species in Tuscany enables us to expand its Italian range and European distribution significantly southwards. Males and females in this species have very different distribution ranges, with males reaching farther West and obviously South than females. This is likely a consequence of differences in their intra-species' niche differentiation between males and females (Safi et al. 2007, van Toor et al. 2011, Alberdi et al. 2012). Of course, the discovery of a single specimen does not allow to make assessments on the species' abundance and habitat use, which will be the subject of further study.

However it seems that the reporting of Parti-colored bat at the Accesa lake (Grosseto province) could well be validated, thus extending its presence farther south. Range expansion as a biogeographical phenomenon might be a possibility in *V. murinus*, but again, this should be only exclaimed once reproduction has been confirmed outside the known range of reproduction; the evidence accumulates recently, that *V. murinus* does occur South of the alps, but so far, no one has reported on females, with or without reproduction.

Land use change is having an effect on many bat species. Climate change and urbanization may influence bat distribution and the case of *V. murinus* may well be driven by human-induced factors. For example In Italy, light pollution has even driven skull size variation in *Pipistrellus kuhlii* (Tomassini et al. 2014). A greater sampling effort and new records will be essential for determining the *status* of the parti-coloured male specimens in Italy.

Fig. 2 - Male of *Vespertilio murinus*

Fig. 3 - Penis of *Vespertilio murinus*

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